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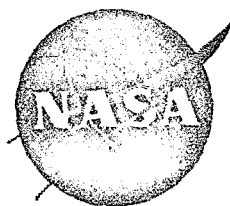
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BIBLIOGRAPHY  
ON PRECIPITATION STATISTICS  
AND RELATED SUBJECTS

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Electronics Research Center  
National Aeronautics and Space Administration  
Cambridge, Massachusetts

PM-60

BIBLIOGRAPHY ON PRECIPITATION  
STATISTICS AND RELATED SUBJECTS

By William I. Thompson, III

Microwave Laboratory  
Electronics Research Center

September 1968

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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BIBLIOGRAPHY ON PRECIPITATION STATISTICS  
AND RELATED SUBJECTS

W. I. Thompson, III

1. Introduction

This bibliography was compiled in conjunction with documentation to be presented by the United States Preparatory Committee to the International Radio Consultative Committee (CCIR) of the International Telecommunication Union (ITU).

A major problem to be faced by the CCIR will be the allocation of the electromagnetic frequency spectrum above 10 GHz ( $10^{10}$  cps). As atmospheric precipitation has a degrading effect on radio waves in this frequency range it is imperative to learn about its temporal and spatial characteristics.

The glossary of the American Meteorological Society defines precipitation as any or all of the forms of water particles, whether liquid or solid, that fall from the atmosphere and reach the ground. It is a major class of hydrometeor; but it is distinguished from cloud, fog, dew, rime, frost, etc. in that it must "fall," and is distinguished from cloud and virga in that it must reach the ground. Precipitation includes drizzle, rain, snow, snow pellets, snow grains,

ice crystals, ice pellets, and hail. For the most part we will be dealing with surface measurements in this bibliography, however some radar information on hydrometeors aloft is included.

Most of the references listed were gathered in the preparation of a handbook of atmospheric effects on electromagnetic wave propagation. Almost all listings are in English and no attempt was made to find all foreign material.

## 2. General Works

Included in this section are encyclopedias, dictionaries, glossaries, and some general tables.

Conway, H. M. Jr., S. L. May, Jr., and E. Armstrong, Jr. (1963), The weather handbook, Conway Publications, Atlanta, GA.

Fairbridge, R. W. (1967), Encyclopedia of atmospheric sciences and astrogeology, Reinhold, New York.

Huschke, R. E. ed. (1959), Glossary of meteorology, American Meteorological Society, Boston.

Letestu, S. ed. (1966), International meteorological tables, WMO-No.188.TP.94, World Meteorological Organization, Geneva.

List, R. J. (1951), Smithsonian meteorological tables, 6th revised edition, Smithsonian Miscellaneous Collections, 114, Smithsonian Institution, Washington, DC.

Malone, T. F. ed. (1951), Compendium of meteorology, American Meteorological Society, Boston, MA.

McIntosh, D. H. (1963), Meteorological glossary, Dawson and Goodall, Bath, England.

- M. O. (1958), Tables of temperature, relative humidity and precipitation for the world, Meteorological Office, M.O.617a-M.O.617f, Her Majesty's Stationary Office, London.
- Nicholson, J. R. (196 ), International Indian Ocean expedition meteorological data catalog, to be published by the East-West Center Press, Honolulu.
- Runcorn, S. K. ed. (1967), International dictionary of geophysics, Pergamon, Oxford.
- Thewlis, J. (1962), Encyclopaedic dictionary of physics, Pergamon, New York.

### 3. Bibliographies

Bibliographies on climatology and related subjects are listed. The United States Weather Bureau publication (USWB, 1962) is a very useful report listing bibliographies on climates for many countries. These are listed in Annex 1 and 2.

AGU, (1960, 1963, 1967), United States National Reports to the International Union of Geodesy and Geophysics, in Trans. Am. Geophys. Un., Brief reports covering the previous 3 or 4 year interval on topics of geophysical interest, American Geophysical Union, Washington, DC.

Bibliographies on hydrology and hydrogeology: African countries. The Comité Inter-Africain d'Etudes Hydrauliques has undertaken the publication of bibliographies on hydrology and hydrogeology covering French-speaking African countries. To date, bibliographies for the following countries have been published: Chad, Dahomey, Ivory Coast, Mauritania, Niger, Senegal, Upper Volta. They are available from the Comité Inter-Africain d'Etudes Hydrauliques, Bureau Technique, 15, Square Max-Hymans, Paris-15<sup>e</sup>. (J. Hydrol., 5, 290, (1967)).

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- Hershfield, D. M. and R. A. Schleusener, (1967), Precipitation, Trans. Am. Geophys. Un., 48, 707-711.
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- Landsberg, H. E. (1960), Climatology, Trans. Am. Geophys. Un., 41, 204-209.
- Lorenz, E. N. (1963), Meteorological statistics and data handling, Trans. Am. Geophys. Un., 44, 394-396.
- USWB, (1962), Compiled list of translations, bibliographies, and miscellaneous publications, United States Weather Bureau, Washington, DC.
- White, R. M. (1960), Statistical methods, Trans. Am. Geophys. Un., 41, 216-217.

#### 4. Precipitation Distribution

These sources were chosen because they dealt with the problem of the spatial and temporal variations of atmospheric precipitation of some manner. The paper by Weibel and Dressel (1967) illustrates the use of climatic data in communication system link design.

- Blackmer, R. H., Jr. (1963), An investigation of thunderstorm distribution over extensive areas, AFCRL-63-910, on Contract No. AF 19(628)-1681, Stanford Research Institute, Menlo Park, CA.
- Blackmer, R. H., Jr. (1966), Probability distributions of precipitation-scatter interference, Final Rpt. Contract NASr-49(23), Stanford Research Institute, Project 3773, Menlo Park, CA.



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- Cole, A. E. and N. Sissenwine, (1955), Rate of rainfall frequencies over selected air routes and destinations, Air Force Surveys in Geophysics No. 66, Air Force Cambridge Research Laboratories, Bedford, MA, (AD 64-781), (report classified, title unclassified).
- Collinge, V. K. and D. G. Jamieson, (1968), The spatial distribution of storm rainfall, J. Hydrol., 6, 45-57.
- Essenwanger, O. (1960), Frequency distributions of precipitation, in Physics of precipitation, Geophysical Monograph No. 5, American Geophysical Union, Washington, DC.
- Fitzpatrick, E. A. (1964), Seasonal distribution of rainfall in Australia analyzed by Fourier methods, Archiv fur Meteorologie, Geophysik und Bioklimatologie, Series, B13.
- Fletcher, R. D. (1950), A relation between maximum observed point and areal rainfall values, Trans. Am. Geophys. Un., 31, 344-348.
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- Gerhardt, J. R. (1958), Observations of small-scale rainfall-rate time variations with sensitive rainfall recording instruments, Bull. Am. Meteorol. Soc., 39, 189-194.

- GPO, (1967), Weather, astronomy, and meteorology, PL 48, Superintendent of Documents, Washington, DC.
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- Hamilton, P. M. (1964), Precipitation profiles for the total radar coverage, Scientific Rpt. MW-37, Stormy Weather Group, McGill University, Montreal, Canada, (AD 606-679).
- Hershfield, D. M., L. L. Weiss, and W. T. Wilson, (1955), Synthesis of rainfall intensity-frequency regimes, Proc. Am. Soc. Civil Eng., 81, Separate No. 744.
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- Hogg, D. C. (1967), Path diversity in propagation of millimeter waves through rain, IEEE Trans. Ant. Prop., AP-15, 410-415.
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- Lambor, J. (1967), Frequency of intense rainfall for the territory of Poland, J. Hydrol., 5, 158-162.
- Lemons, H. (1943), Semimonthly distribution of hail in the United States, Mon. Weather Rev., 71, 115-122.
- McDonald, W. F. (1929), Hourly frequency and intensity of rainfall at New Orleans, LA, Mon. Weather Rev., 57, 1-8.
- Reich, B. M. (1963), Short-duration rainfall-intensity estimates and other design aids for regions of sparse data, J. Hydrol., 1, 3-28.
- Reich, B. M. (1965), Estimating flood peaks from South African catchments, J. Hydrol., 3, 231-253.
- Rodda, J. C. (1967), A country-wide study of intense rainfall for the United Kingdom, J. Hydrol., 5, 58-69.
- Russak, S. L. (1957), A practical method for determining the distribution of rainfall with altitude, ER 9110, The Martin Co., Baltimore, MD.

- Russak, S. L. and J. W. Easley, (1957), A method of determining the frequency and intensity of rain over specified short distances from climatic data, ER 9418, The Martin Company, Baltimore, MD.
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- Sansom, H. W. (1966), The occurrence and distribution of hail in Africa, Meteorol. Mag., 95, 212-218.
- Soane, C. M. and V. G. Miles, (1955), On the space and time distribution of showers in a tropical region, Quart. J. Roy. Meteorol. Soc., 81, 440-448.
- Souter, R. K. and J. D. Emerson, (1952), Summary of available hail literature and the effect of hail on aircraft in flight, NACA Technical Note No. 2737, National Advisory Committee on Aeronautics, now the National Aeronautics and Space Administration, Washington, DC.
- USWB, (1952), Mean number of thunderstorm days in the United States, Technical Paper No. 19, United States Weather Bureau, Washington, DC.
- USWB, (1955), Rainfall intensity-duration-frequency curves for selected stations in the United States, Alaska, Hawaiian Islands, and Puerto Rico, Technical Paper No. 25, United States Weather Bureau, Washington, DC.
- USWB, (1958), Rainfall intensity-frequency regime, part 2 - southeastern United States, Technical Paper No. 29, United States Weather Bureau, Washington, DC. (Available from Supt. Documents).
- Weibel, G. E. and J. O. Dressel, (1967), Propagation studies in millimeter-wave link systems, Proc. IEEE, 55, 497-513.
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- WMO, (1956), World distribution of thunderstorm days, World Meteorological Organization Rpt. WMO/OMM-No. 21, TP.21, Geneva.
- Yarnell, D. L. (1935), Rainfall intensity-frequency data, United States Dept. of Agriculture Miscellaneous Publication No. 204, Washington, DC.

## 5. Climatology, Hydrology, and Hydrometeorology

In order to obtain statistics from presently available information it seems imperative that these fields be studied and their information utilized.

Bruce, J. P. and R. H. Clark, (1966), Introduction to hydrometeorology, Pergamon, New York.

Chow, V. T. ed. (1964), Handbook of applied hydrology, McGraw-Hill, New York.

Critchfield, H. J. (1966), General climatology, 2nd. Edition, Prentice-Hall, Englewood Cliffs, NJ.

Fletcher, R. D. (1951), Hydrometeorology in the United States, in Compendium of Meteorology, American Meteorological Society, Boston, MA.

Linsley, R. K., M. A. Kohler, and J. L. Paulhus, (1949), Applied hydrology, McGraw-Hill, New York.

Majundar, K. C. (1965), A method of estimation of extreme values corresponding to continuous records from a limited number of observations, J. Hydrol., 3, 312-318.

Sellers, W. D. (1965), Physical climatology, University of Chicago Press, Chicago, IL.

Trewartha, G. T. (1954), An introduction to climate, McGraw-Hill, New York.

USWB, Various publications on climatology,  
(1) Climatological data, national summary,  
(2) Monthly climatic data for the world,  
(3) Monthly weather review,  
(4) Storm data,  
(5) Local climatological data, with comparative data.

## 6. Thunderstorms

Here are listed key works on the nature of thunderstorms and their distribution over the globe. Brief discussions may be found in many of the works listed in Section 2.

Brooks, C. E. P. (1925), The distribution of thunderstorms over the globe, Geophysical Memoirs, No. 24, Air Ministry Meteorological Office London.

Byers, H. (1951), Thunderstorms, in Compendium of meteorology, American Meteorological Society, Boston, MA.

Byers, H. R. and R. R. Braham, Jr. (1949), The thunderstorm, United States Government Printing Office, Washington, DC.

Gold, H. K. et. al. (1947), Thunderstorm rainfall, Hydro-meteorological Rpt. No. 5, United States Weather Bureau, Washington, DC.

Hessdredt, E. (1954), Thunderstorm frequency in Norway, 1936-1950, Oslo Institute of Theoretical Astrophysics.

Markovich, M. L. and V. M. Muchnik (1960), The structure of thunderstorm showers, according to data on the intensity distribution of radar echoes with height, Ukrains'kyi Fizychnyi Zhurnal, 5, 259-269: translated by the Am. Meteorol. Soc. under AF contract number AF 19(604)-6113.

Newton, C. W. (1967), Severe convective storms, Advances in Geophysics, 12, 257-303.

USWB, (1952), Mean number of thunderstorm days in the United States, Technical Paper No. 19, United States Weather Bureau, Washington, DC.

WMO, (1953), World distribution of thunderstorm days, WMO/OMM-No. 21, TP.6, World Meteorological Organization, Geneva.

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## 7. Miscellaneous

- AMS, (1967), A selective bibliography in meteorology,  
Weatherwise, 20, 204-219.
- Mason, B. J. (1961), The physics of clouds, rain, and  
lightning, Imperial College of Science and Technology,  
London.
- Pullen, R. A. (1968), Computation of the moisture content of  
the atmosphere using surface level climatological data,  
J. Hydrol., 6, (to be published).
- Semplak, R. A. (1966), Gauge for continuously measuring rate  
of rainfall, Rev. Sci. Instr., 37, 1554-1558.
- Weickmann, H. ed. (1960), Physics of precipitation,  
Geophysical Monograph No. 5, American Geophysical Union,  
Washington, DC.

# ANNEX 1 - GENERAL CLIMATIC BIBLIOGRAPHIES\*

## AREA AND/OR COUNTRY INDEX

	SOURCE NO.
Arabian Peninsula	13
Australia	14
Austria	32
Belgium	24
British Cameroons	22
Cape Verde Islands	18
Colombia	36
Cuba	25
Eastern Mediterranean	1
Egypt	7
Eritrea	15
Ethiopia	15
Finland	20
Formosa	21, 39
France	8
Germany	2
Greece	35
Hong Kong	21, 39
Indochina	16
Indonesia	37
Iraq	3
Jordan	33
Korea	34
Lebanon	12
Libya	26
Luxembourg	24
Macao	21, 39
Mexico	4
Morocco	17

\*From United States Weather Bureau report "Compiled list of translations, bibliographies, and miscellaneous publications," Prepared in the Foreign Area Section, Office of Climatology, Washington, D.C., 1962.

# AREA AND/OR COUNTRY INDEX

	SOURCE. NO.
Netherlands	27
New Zealand	9
Nigeria	22
Norway	23
Nyasaland	38
Pakistan	10
People's Republic of China	28
Poland	29
Portugal	18
Rhodesia	38
Somalilands	15
Southwest Pacific Ocean	5
Sweden	11, 30
Switzerland	31
Tunisia	19
Western Pacific Ocean	6



1958

- 1\* Bibliography of climatic maps of the Eastern Mediterranean by A.E. Grimes. 30 abstracts.
2. Bibliography of climatic maps of Germany by V.J. Creasi and J.A. Wallace, Jr. 88 abstracts.
3. Bibliography of climatic maps for Iraq. by S. J. Roman. 53 abstracts.
- 4\* Selected annotated Bibliography on climatic maps of Mexico. by E. J. Saltsman. 48 abstracts.
5. Selected bibliography of climatic maps for the Southwest Pacific Ocean. by C.S. Vitale and T.A. Bender, Jr. 64 abstracts.
6. Selected bibliography of climatic maps for the Western Pacific Ocean. by T.A. Bender, Jr. and C.S. Vitale. 47 abstracts.

1959

7. Bibliography of climatic maps of Egypt. by A. E. Grimes. 23 abstracts.
8. Bibliography of climatic maps for France. by A. E. Grimes. 33 abstracts.
9. Bibliography of climatic maps for New Zealand. by V. J. Creasi. 58 abstracts.
10. Selected bibliography of climatic maps for Pakistan. by A. E. Grimes. 27 abstracts.
11. Selected bibliography of climatic maps for Sweden. by A. E. Grimes. 22 abstracts.

1960

12. An annotated bibliography of climatic maps of Lebanon. by A. E. Grimes. 45 abstracts.
13. Bibliography of climatic maps of the Arabian Peninsula. by A. E. Grimes. 26 abstracts.
14. Bibliography of climatic maps for Australia. by V. J. Creasi. 86 abstracts.
15. Bibliography of climatic maps for Ethiopia, Eritrea, and the Somalilands. by A. E. Grimes. 39 abstracts.

16. Bibliography of climatic maps of Indo-China. by A. E. Grimes. 59 abstracts.
17. Bibliography of climatic maps of Morocco. by A. E. Grimes. 28 abstracts.
18. Bibliography of climatic maps of Portugal and Cape Verde Islands. by C. S. Vitale. 44 abstracts.
19. Bibliography of climatic maps of Tunisia. by A. E. Grimes. 25 abstracts.
20. Selected bibliography of climatic maps for Finland. by V. J. Creasi and N. A. Stepanova. 61 abstracts.
21. Selected bibliography of climatic maps of Formosa, Hong Kong and Macao. by V. J. Creasi and T. A. Bender, Jr. 24 abstracts.
22. Selected bibliography of climatic maps for Nigeria and the British Cameroons. by T. A. Bender, Jr. 41 abstracts.
23. Selected bibliography of climatic maps of Norway. by V. J. Creasi. 34 abstracts.

1961

24. An annotated bibliography of climatic maps for Belgium and Luxembourg. by S. J. Roman. 21 abstracts.
25. An annotated bibliography of climatic maps on Cuba. by A. E. Grimes. 28 abstracts.
26. An annotated bibliography on climatic maps of Libya. by A. E. Grimes. 22 abstracts.
27. An annotated bibliography of climatic maps of the Netherlands. by A. E. Grimes and M. L. Weight. 24 abstracts.
28. An annotated bibliography on climatic maps of People's Republic of China. by J. A. Wallace, Jr. 50 abstracts.
29. An annotated bibliography on climatic maps of Poland. by A. E. Grimes. 46 abstracts.
30. An annotated bibliography on climatic maps of Sweden. by A. E. Grimes. 73 abstracts.

31. An annotated bibliography of climatic maps of Switzerland. by A. F. Spano and M. L. Weight. 25 abstracts.
32. Annotated bibliography of climatic maps of Austria. by Foreign Area Section, Office of Climatology. 26 abstracts.
33. Annotated bibliography of climatic maps of Jordan. by D. M. Carraway 33 abstracts.
34. Bibliography of climatic maps of Korea. by D. M. Carraway. 28 abstracts.
35. Selected annotated bibliography of climatic maps for Greece. by H.K. Gold. 37 abstracts.

1962

36. An annotated bibliography off climatic maps of Colombia. by A. F. Spano. 23 abstracts.
37. An annotated bibliography of climatic maps of Indonesia. by J. A. Wallace, Jr. 34 abstracts.
38. Annotated bibliography of climatic maps for the Federation of Rhodesia and Nyasaland. by S. J. Roman. 30 abstracts.
39. Supplement to the selected bibliography of climatic maps of China (Formosa), Hong Kong and Macao. by J. A. Wallace, Jr. 17 abstracts.

## ANNEX 2 - CLIMATIC MAPS BIBLIOGRAPHIES\*

AREA AND/OR COUNTRY INDEX	SOURCE NO.
Angola	3
Antarctic	4
Arabian Peninsula	35
Arctic	5
Australia	37
Belgian Congo	6
British East Africa	1
British Honduras	41
Caucasus	36
Chile	7
Colombia	8
Costa Rica	9
Cuba	30
Cyprus	31
Ecuador	10, 18
Germany	35
Gibraltar	33
Greece	38
Greenland	22, 34
Guatemala	11
Guianas (British, Dutch and French)	23
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\*From United States Weather Bureau report "Compiled list of translations, bibliographies, and miscellaneous publications," Prepared in the Foreign Area Section, Office of Climatology, Washington, D.C., 1962.

# AREA AND/OR COUNTRY INDEX

	SOURCE NO.
Panama	15, 20
Peru	2
Salvador	16
South Indian Ocean Islands	44
South Pacific Ocean Islands	40
South Rhodesia	14
Turkey	27, 28
Venezuela	17, 21

1955

- 1.\* Bibliography on the climate of British East Africa. Foreign Area Section, Office of Climatology. 115 abstracts.
- 2\* Bibliography on the climate of Peru. Foreign Area Section, Office of Climatology, 34 abstracts.

1956

3. Bibliography on the climate of Angola. by D. M. Carraway, 85 abstracts.
4. Bibliography on the climate of the Antarctic by D. M. Carraway. 139 abstracts.
5. Bibliography on the climate of the Arctic by V.J. Creasi. 147 abstracts.
- 6\* Bibliography on the climate of Belgian Congo by J. Markus, 145 abstracts.
- 7\* Bibliography on the climate of Chile by J. Markus. 58 abstracts.
- 8\* Bibliography on the climate of Colombia, Foreign Area Section, Office of Climatology. 38 abstracts.
- 9\* Bibliography on the climate of Costa Rica. by N.A. Stepanova. 55 abstracts.
- 10\* Bibliography on the climate of Ecuador. Foreign Area Section, Office of Climatology. 33 abstracts.
- 11\* Bibliography on the climate of Guatemala by N.A. Stepanova. 57 abstracts.
- 12\* Bibliography on the climate of Honduras by N.A. Stepanova. 33 abstracts.
- 13\* Bibliography on the climate of New Zealand. Foreign Area Section, Office of Climatology. 136 abstracts.
- 14\* Bibliography on the climate of Nyasaland, Northern and Southern Rhodesia. Foreign Area Section, Office of Climatology. 61 abstracts.
- 15\* Bibliography on the climate of Panama by N.A. Stepanova. 63 abstracts.
- 16\* Bibliography on the climate of Salvador by N.A. Stepanova. 44 abstracts.
- 17\* Bibliography on the climate of Venezuela by A.D. Peterson. 39 abstracts.

- 18\* Secondary bibliography on climate of Ecuador. Foreign Area Section, Office of Climatology. 80 abstracts.
- 19\* Secondary bibliography on climate of New Zealand by A.E. Grimes and J. Markus. 40 abstracts.
- 20\* Secondary bibliography on climate of Panama. by N.A. Stepanova. 47 abstracts.
- 21\* Secondary bibliography on climate of Venezuela by A.D. Peterson. 51 abstracts.

1957

- 22. Bibliography on the climate of Greenland. by P.H. Putnins et al. 469 abstracts, 120 data surveys.
- 23. Bibliography on the climate of the Guianas (British, Dutch, and French). by S.J. Roman. 92 abstracts.
- 24. Bibliography on the climate of Indochina. by A.E. Grimes. 129 abstracts.
- 25. Bibliography on the climate of Iran. by A. D. Peterson. 84 abstracts.
- 26. Bibliography on the climate of Iraq. by A.D. Peterson. 50 abstracts.
- 27. Bibliography on the climate of Turkey. by A. D. Peterson and N.A. Stepanova. 81 abstracts.
- 28. Secondary bibliography on the climate of Turkey. by A.D. Peterson and N.A. Stepanova. 72 abstracts.
- 29. Supplement to the bibliography on the climate of Iraq. by A.D. Peterson. 13 abstracts.

1958

- 30. Bibliography on the climate of Cuba. by A.E. Grimes. 224 abstracts.
- 31. Bibliography on the climate of Cyprus. by J.A. Wallace, Jr.. 102 abstracts.
- 32. Bibliography on the climate of Indochina. No. II. by A.E. Grimes. 67 abstracts.
- 33. Bibliography on the climate of Malta and Gibraltar. by J.A. Wallace, Jr., 120 abstracts.

34. Supplement to the bibliography on the climate of Greenland. by V.J. Creasi. 77 abstracts, 7 data surveys.
35. Supplementary bibliography on the climate of Germany, 1950-1957. by N.A. Stepanova and A.F. Spano. 53 abstracts.

1960

36. An annotated bibliography on the climate of the Arabian Peninsula. by A.E. Grimes. 124 abstracts.
37. Annotated bibliography on the climate of the Caucasus. by N.A. Stepanova. 134 abstracts.
38. Selected bibliography on the climate of Australia. by V.J. Creasi 219 abstracts.
39. Selected bibliography on the climate of Greece. by T.A. Bender, Jr., 82 abstracts.
40. Selected bibliography on the climate of Norway. by V.J. Creasi. 93 abstracts.
41. Selected bibliography on the climate of the South Pacific Islands. by H.K. Gold and T.A. Bender, Jr. 113 abstracts.

1961

42. An annotated bibliography on the climate of British Honduras. by A.F. Spano and J.A. Wallace, Jr., 23 abstracts.
43. An annotated bibliography on the climate of Jordan. by J. A. Wallace, Jr. 95 abstracts.
44. An annotated bibliographies on the climate of Lebanon. by A.E. Grimes. 125 abstracts.
45. An annotated bibliography on the climate of the South Indian Ocean Islands. by J.A. Wallace, Jr. 123 abstracts.